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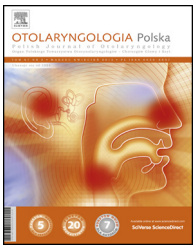

Original research article/Artykuł oryginalny

Usefulness of snoreplasty in the treatment of simple snoring and mild obstructive sleep apnea/hypopnea syndrome – Preliminary report

Zastosowanie snoreplastyki iniekcyjnej w leczeniu chrapania i łagodnej postaci zespołu obturacyjnych bezdechów podczas snu – doniesienie wstępne

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ABSTRACT

The aim of the study: To assess the effectiveness of sodium tetradecyl sulfate injection in the region of the soft palate to treat primary snoring and mild obstructive sleep apnea/hypopnea syndrome. Sodium tetradecyl sulfate, a preparation belonging to detergents, widely applied in Poland to treat varices by the method of compressive sclerotherapy was used in the study. **Material and methods:** The procedure of injected snoreplasty was performed in 21 patients, who were diagnosed with primary snoring or mild obstructive sleep apnea/hypopnea syndrome, based on subjective examination and polysomnography. Injected snoreplasty involves administration of sodium tetradecyl sulfate in the form of Fibrovein 1% or 3% preparation in the volume of 2 ml, in the region of the soft palate. Injection of the preparation in the area of the soft palate induces the development of aseptic inflammation, which creates a scar which stiffens the soft palate and makes the tissues of this region less susceptible to vibrations. **Results:** The patients after injected snoreplasty reported a significant decrease in the intensity of snoring. The markedly shortened total time of snoring was found in check-up polysomnography performed six months after the procedure. **Conclusions:** Injected snoreplasty is an effective procedure, especially, in patients manifesting persistent snoring. It is not indicated in the treatment of obstructive apneas during sleep. The advantages of this method are: minimal invasiveness, the low number of complications and slight pain.

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Introduction

Snoring constitutes an essential social problem, affecting 40–60% of adults [1]. It is caused by the tissue oscillation of the soft palate and adjacent structures. During sleep various factors, both anatomical and those associated with neuromuscular function, may cause the collapse of soft tissues of the upper respiratory tract. The air squeezing through the narrow oropharynx makes the adjacent structures vibrate, which induces snoring sounds. This is associated with a decrease in the quality of the patient's sleep and most of all, of the person sleeping with him/her. Snoring is frequently the first symptom of obstructive sleep apnea/hypopnea syndrome (OSAHS), which, when left untreated, may have serious cardiovascular consequences [2].

The first step in treatment of snoring is body mass loss and observing sleep hygiene practices, *e.g.*, regular sleeping schedule, abstaining from alcohol consumption in the evening and avoiding hypnotics and sedatives. It is also essential to check physiological respiratory passageways to exclude obstruction and elevated air resistance in the nasal cavities, connected with the deviation of the nasal septum or hypertrophy of the nasal turbinates. Surgical treatment of nasal obstruction solves the problem of snoring only in the case of 12–24% of patients [3]. In the rest of patients, it is necessary to restore patency of the upper respiratory airways. Such procedures as uvulopalatopharyngoplasty [4], laser-assisted palatoplasty [5], radio frequency ablation of the soft palate [6] and injection snoreplasty have been developed to accomplish this goal. Of all these surgeries, injection snoreplasty is a procedure performed exclusively in patients with primary snoring – a disorder caused by vibration of the soft palate and the uvula. It can also be considered in a mild type of OSAHS.

Injected snoreplasty was introduced as a treatment of snoring in 1999 year at Walter Reed Army Medical Center in Washington. Dr. J.F. Strauss from Chicago was the first physician to employ this technique, of injecting a sclerosing agent into the soft palate, thereby reducing the subjects snoring.

The aim of the study is to determine the effectiveness of sodium tetradecyl sulfate injection in the region of the soft palate to treat snoring and mild OSAHS (obstructive sleep apnea–hypopnea syndrome).

Material and methods

The procedure of injected snoreplasty was performed in 21 adult patients, who were diagnosed with snoring or mild obstructive sleep apnea/hypopnea syndrome ($5 < \text{AHI} < 15$), based on subjective examination and polysomnography. Our inclusion criteria included both genders, from 18 to 65, with no coagulation and metabolic diseases and with small palatal tonsils (I or II degree in Friedman's scale). Pregnant women were excluded from the study. According to these criteria our study group included patients from 28 to 65 years (mean age 46.5).

Before and six weeks after procedure each patient filled in a questionnaire relating to characteristic symptoms of the disease. Injected snoreplasty was carried out in patients complaining of persistent snoring with the normal patency of the nasal passageways, in whom the height of the tongue base did not exceed the grade III in the Friedman scale, and the apnea–hypopnea index was not higher than 10 (Fig. 1). The procedure was not performed in the patients who had central and mixed apneas recorded in the sleep examination.

Fig. 1 – Middle pharynx. A needle is placed in soft palate during snoreplasty

Injected snoreplasty involves the injection of sodium tetradecyl sulfate in the form of Fibrovein 1% or 3% preparation in the volume of 2 ml, into the region of the soft palate. Sodium tetradecyl sulfate is a preparation belonging to detergents, widely used in Poland to treat varices by the method of compressive sclerotherapy. Injection of the preparation in the region of the soft palate induces the development of aseptic inflammation, creating a scar which stiffens the soft palate and makes the tissues of this region less susceptible to vibrations. The preparation is applied subepithelialy in three injections. The injection of 1 ml of 1% Fibrovein are given in the medial line, 1 cm above the uvula base (Fig. 2) and two injections of 0.5 ml each of the preparation are given to the right and left from the first injection. Additionally, the uvula is shortened to achieve a better therapeutic effect in patients. Soft palate after snoreplasty is shown in Fig. 3.

Six months after the procedure, each patient undergoes follow-up polysomnography to assess the AHI index and the time and number of snoring episodes.

The consent for the study was obtained from the Bioethics Committee at the Medical University of Bialystok No. R-I-002/52/2012.

A *t*-Student test has been used for dependent samples. Statistical significance level was assumed at $p < 0.05$.

Results

The patients after injected snoreplasty reported a significant decrease in the intensity of snoring. The

Fig. 2 – Soft palate before snoreplasty

Fig. 3 – Soft palate after snoreplasty

markedly shortened total time of snoring was found in follow-up polysomnography performed several months after the procedure. In patients, reporting the average total time of snoring 2 h before the procedure, it was reduced at least by a half after the procedure. Similarly, the number of snoring episodes decreased during sleep. The index of apnea–hypopnea fell down by a maximum of 7. In the majority of patients, it oscillated at the similar level before and after the procedure. According to a questionnaire the patients reported not only a decrease in duration but also a decrease of snoring intensity. The number of points obtained in the questionnaire did not show a significant difference even if the patients reported large subjective change in the quality of sleep; however, polysomnographic evaluation showed a decrease of total time of snoring and desaturation events (Table I). Significant differences were observed before and after snoreplasty for total time of snoring, Epworth's scale and oxygen desaturation events.

Painful swelling of the soft palate with an accompanying feeling of a foreign object in the throat represents the main complications and side effects of this method. These complaints were found in all patients undergoing this procedure and they recovered spontaneously after 10–14 days. In the initial period after the procedure, patients reported intensified snoring due to the swollen soft palate; however, subsequently, the intensity of snoring and number of snoring events progressively decreased. In one patient, a small, about 2 mm, erosion was observed at the site of a needle insertion, but it healed spontaneously 6 weeks after the procedure. The patients who complained of pain were advised to take over-the-counter painkillers.

Discussion

Snoring is not only a medical problem but a social one as well. It disturbs night silence and may cause a bed separation of spouses and partners. Snoring is a common condition which generally results from narrowing and partial obstruction of the upper airways during sleep [7]. 45% of normal adults snore at least occasionally and 25% are habitual snorers. It is caused by the vibration of enlarged soft palate with uvula, base of tongue, tissues of posterior

Table I – Comparison of selected subjective and objective parameters of sleep before and after snoreplasty

	AHI	Total time of snoring	Epworth's scale	Oxygen desaturation events
Before snoreplasty mean value	4.6/H	110 min	9	8.8/H
Before snoreplasty maximum value	9/H	250 min	16	19/H
Before snoreplasty minimum value	0.5/H	10 min	4	2/H
After snoreplasty mean value	3.6/H	22 min	5	4.4/H
After snoreplasty maximum value	8/H	103 min	10	11/H
After snoreplasty minimum value	0.1/H	2 min	2	0.1/H
p	0.150	**0.04**	**0.01**	**0.035**

and lateral pharyngeal walls as well as the epiglottis. There are a variety of different medical treatments for snoring including weight loss, fitness program, dietary changes, smoking cessation as well nasal and oral appliances [8]. Surgical procedures for simple snoring which have been estimated as minimal invasion are varied and controversial. Injected snoreplasty has become a widely accepted technique for the treatment of snoring. We performed snoreplasty in 21 patients as a treatment for snoring and mild sleep apnea syndrome (AHI up to 10). According to our experience the procedure is effective in most cases. We found that the loudness of snoring and the frequency of snoring episodes significantly decrease. The number of obstructive apneas may slightly go down. We agree with other authors that the procedure is safe [8–10]. It is also easily performed in a routine 15-min outpatient visit which is in agreement with Brietzke and Mair [10]. Al-Jassim and Lesser performed injection snoreplasty in sixty patients with habitual snoring and estimated a single dose injection snoreplasty as not only an effective treatment but also as safe and simple one [11]. Snoreplasty is an effective treatment for primary snoring and mild sleep apnea when its origin lies exclusively at the soft palate. This is in agreement with other authors as well [12].

Iseri and Balcioglu compared the effectiveness of radiofrequency *versus* injection snoreplasty in simple snoring. Both procedures were found to be safe; however discomfort levels were higher with radiofrequency therapy than injected snoreplasty. The authors found both procedures with mild and transient complications. Some patients presented with edema of the uvula in the early post application period with radiofrequency but only 2 of them required steroid treatment [8]. We did not observe any cases of moderate or severe pain after injection snoreplasty. The patient complaints were mostly of a strange sensation in the area of injections. They described the feelings as the presence of foreign body or growing body and swelling or pain with edema in the area of soft palate. Similar complications were described by Iseri and Balcioglu [8] and Brietzke and Mair [10]. Palatal swelling is not limited to injection snoreplasty alone but it may occur after radiofrequency ablation or laser assisted uvuloplasty [13]. In some case, especially when 3% of sodium tetradecyl sulfate is used for injected snoreplasty, a superficial palatal mucosal breakdown can be observed. We have not observed this complication which usually does not require a treatment in our patient group. Some authors even think that patients with palatal mucosal breakdown generally have more robust palatal stiffening and better snoring results [10]. There is also a possibility of palatal perforation which happens exceptionally and even so it may close ultimately.

Generally most of the patients if not almost all of them heal spontaneously without complications and with good snoring results. Some patients with thinner soft palates like small and slender females and patients who are at risk of poor wound healing, such as diabetics, and patients who use tobacco and patients with vascular disease consideration should be made to use a smaller volume of the injection [10].

Currently, there are no standards or definition for efficacy or success of surgical procedures for snoring so it is important to make a good estimation of the cause of snoring and predict the benefit from snoreplasty. We need a long-term study that will evaluate the success of the surgery, the effect on surrounding tissue fluttering, the intensity of acoustic sensations using acoustic analysis and sleep endoscopy as well as a scale of complications.

Conclusion

As a result of this study, we can conclude that snoreplasty is a safe, simple, minimal invasive outpatient procedure that may cause only mild pain. It is useful for snoring and mild obstructive sleep apnea syndrome when the cause of snoring is the vibration of an enlarged soft palate with uvula.

Authors' contributions/Wkład autorów

EO – study design, data interpretation, literature search and funds collection. JP – data collection and interpretation, statistical analysis and literature search. MR – acceptance of final manuscript version and funds collection.

Conflict of interest/Konflikt interesu

None declared.

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Ethics/Etyka

The work described in this article has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for experiments involving humans; EU Directive 2010/63/EU for animal experiments; Uniform Requirements for manuscripts submitted to Biomedical journals.

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